The Genus *Hirstionyssus* Fonseca in Panama
(Acarina: Dermanyssidae)

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Seventeen species of the relatively large genus *Hirstionyssus* are known from the New World. With the exception of *H. butantanensis* (Fonseca, 1932) from Brazil, all of these records are North American. A recent collection from Panamanian rodents contained seven new species, described below. Six (*H. heteromydis, panamensis, minutus, galindoi, lunatus,* and *microchelae*) are from heteromyid and cricetid rodents, and one (*H. keenani*) is from squirrels. Three (*H. heteromydis, panamensis,* and *minutus*) form a closely related group. A key to the females of *Hirstionyssus* of Panama is included.

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Genus **Hirstionyssus** Fonseca

Hirstionyssus Fonseca, 1948, Proc. Zool. Soc. Lond., 118: 226.

Type-species: *Dermanyssus arcuatus* C. L. Koch, 1839.

Hirstionyssus heteromydis, new species. Figures 4, 5.

DIAGNOSIS: The female is 700 μ long and one-half as wide. Its sternal plate is rectangular and not quite twice as wide as long; its epigynial plate narrowly linguiform, and its anal plate elliptical. The movable chela is about

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one-half the length of the second cheliceral segment. The coxal spur formula is 0-2-2-0. Tarsus II is without apical claw-like spurs.

DESCRIPTION, HOLOTYPE FEMALE: *Idiosoma.*—767 μ long by 378 μ wide.

Venter (fig. 4D).—With 20–25 pairs of subequal and rather delicate opisthosomal setae. Sternal plate (fig. 4F) rectangular, sides slightly concave, posterior margin straight, anterior angles projected between coxae I and II, posterior angles broadly truncate; with three pairs of setae and two pairs of circular pores; first sternal setae just off the plate; entire plate lightly stippled, with very faint reticulations. Presternal area sclerotized and reticulated. Tritosternum (fig. 4F) without hyaline margins; basal portion lightly wrinkled; with two laciniae, weakly plumose at tips. Metasternal seta and pore present but metasternal plate absent. A narrow endopodal apodeme present between coxae III and IV. Epigynial plate slender, linguiform, obtusely pointed posteriorly, surface punctate with two median, longitudinal, slightly divergent lines; with a single pair of setae; membranous anterior portion partly overlapping sternal plate. A pore each side on soft integument near genital setae. Anal plate about twice as long as wide, elliptical; with a pair of small, circular marginal pores (generally more marginal than shown); paired adanal setae at the anterior margin of the anus; anal setae slightly smaller than the ventral setae. All coxae with piliform setae; small fimbria present on anterior peripheral margins of coxae. Coxa I with two setae. (Both coxae I of the holotype have a noticeable longitudinal furrow adjacent to the proximal seta as in fig. 4D. This is seen as a shallow depression in some paratypes and is not evident at all in others.) Coxa II with two setae; anterior marginal spur prominent; posterior margin sharply angulate; the single ventral spur low, broad and dolabrate. Coxa III with two setae, a blunt ventral spur and a slender, sharp, posterior marginal spur. Coxa IV with a single seta; without spur. Stigma ventral, appearing between femora III and IV; peritremalia narrow and curving posterior to coxa IV: Peritreme bending dorsally before coxa II and terminating at a point level with middle of coxa I; peritremal plate narrow, widening at level of seta L2, continuing forward to anterior margin of coxa I.

Dorsum (fig. 4E).—Dorsal plate with straight or slightly convex sides, tapering posteriorly to a point; with a pair of slit-like pores at anterior margin and at least eight pairs of small circular pores scattered over remainder of plate; with about 25 pairs of small, widely separated setae, those anterior about twice the size of the others. Some 27 pairs of small setae on unarmored dorsum. (Under oil-immersion magnification the posterior setae may be seen to have one or two small barbs.)

Gnathosoma (figs. 4A–C).—With 16–18 rows of one or two deutosternal teeth per row; hypostomal processes drawn out into two, long indistinct lacinae; corniculi lacking or not visibly defined (as is true of all Dermanyssidae), tectum a transparent, flaccid membrane with a transverse, blunt, denticulate anterior margin; chela slender, edentate and very long, making up almost one-half of the length of the second cheliceral segment; setae of gnathosoma slender; of the two apical setae on dorsal side of pedipalp, the inner is blunt and a bit heavier than the outer.

Legs.—Setation as shown; without unusual modifications; femora I and II each with three setae more robust than others; all ventral setae longer than dorsal setae and especially long on tarsus where there are two ventral whip-like setae as long as the segment; without clawlike setae or spurs at apex of tarsus II.

Measurements of sample.—Ten female specimens were measured. The numbers are averages. Idiosoma, length (exclusive of gnathosoma) 700 μ; width 355 μ. Dorsal shield, length 600 μ; width 300 μ. Sternal plate, length (at midline) 70 μ; width (at bases of second sternal setae) 127 μ. Epigynial plate, length 240 μ; width (just posterior to genital setae) 75 μ. Anal plate, length (anterior border to base of postanal seta) 85 μ; width 60 μ. Legs (including coxa but excluding pretarsus): I, 410 μ; II, 335 μ; III, 320 μ; IV, 390 μ.

ALLOTYPE MALE (figs. 5B–D): Length 460 μ; width 270 μ. Legs: I, 330 μ; II, 260 μ; III, 260 μ; IV, 330 μ. Coxae I–III are as in female; coxa IV has a sharply pointed posterior marginal spur, and tarsus II has two apical claw-like setae ventrally. The holoventral plate is slightly more heavily sclerotized in the region of the genital pore

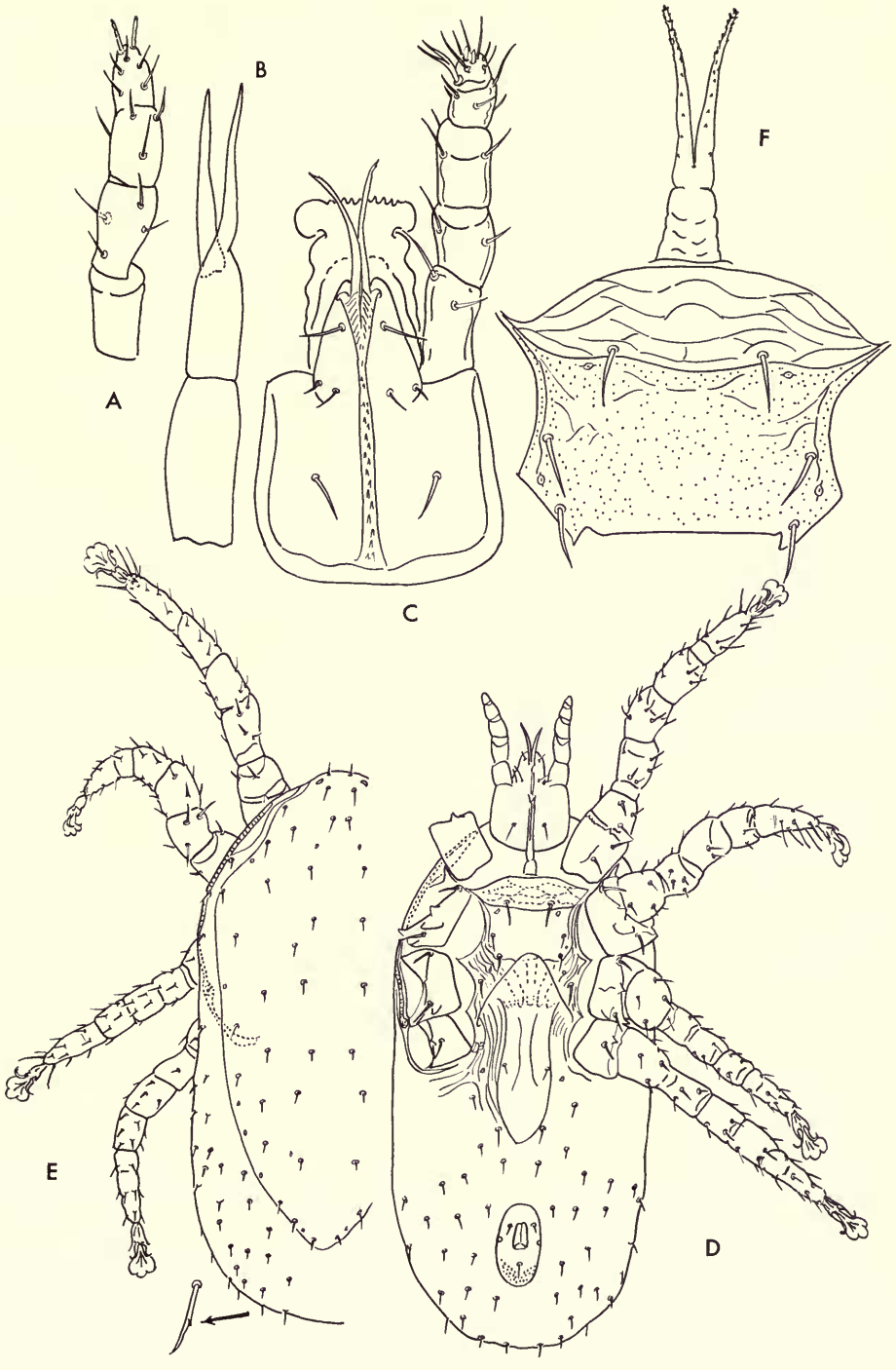

FIG. 4. *Hirstionyssus heteromydis*, new species, female. A, palp. B, chelicera. C, gnathosoma, ventral view. D, venter. E, dorsum. F, sternal plate and tritosternum.

than elsewhere. The sternal pores are circular, as in the female. The dorsal plate tapers less than in the female and covers almost all of the dorsum.

DEUTONYMPH (figs. 5E–H): Length 490 μ (480–550). Legs: I, 330 μ; II, 280 μ; III, 270 μ; IV, 310 μ. The three pairs of terminal setae on the dorsal plate are progressively larger toward the end, and are faintly serrate (the terminal pair, which is twice as long as the subterminal pair, is shown greatly enlarged in fig. 5F).

TYPE MATERIAL: Holotype female (U.S.N.M. no. 2817) and 10 paratype females from *Heteromys desmarestianus*, Piña (Canal Zone), 20 December 1960, collected by C. E. Yunker, in the United States National Museum. Allotype male, same data but 13 December 1960, in the United States National Museum. Remainder of material, including 26 paratype females, 3 paratype males and 5 paratype nymphs, same data but 13-20 December 1960, distributed among the collections of Rocky Mountain Laboratory, Hamilton, Montana; Texas Technological College, Lubbock; Institute of Acarology, Agriculture Experiment Station, Wooster, Ohio; Snow Entomological Museum, University of Kansas, Lawrence; British Museum (Natural History), London; Entomology Research Institute, Canada Department of Agriculture, Ottawa; Zoological Institute, Academy of Sciences U.S.S.R., Leningrad; Natal Museum, Pietermaritzburg; Musée National d'Histoire Naturelle, Paris; Institute Royal des Sciences Naturelle de Belgique, Brussels; and Instituto Butantan, São Paulo.

ADDITIONAL MATERIAL EXAMINED: 19 females of *H. heteromydis* from *Heteromys desmarestianus*, from Piña (Canal Zone), 6-21 December 1960; 10 females from same host, from Fort Gulick (Canal Zone), 1 February 1961; a single female from same host, Río Changena (Bocas del Toro), at lower camp, approx. 22 miles WSW of Almirante, 9 September 1961; all collected by C. E. Yunker.

REMARKS: Very little variation was seen in the sample. The denticulation on the distal margin of the coxae, however, was quite variable, and in addition, it could not always be established clearly that coxa III had two spurs. The first sternal setae do not always appear to be off the plate, but are sometimes seen to be connected to the plate by indistinct sclerotized bridges.

Hirstionyssus panamensis, new species. Figure 6.

DIAGNOSIS: The female is slightly less than 600 μ long and is one-half as wide. Its sternal plate is rectangular, three times wider than long, its genitoventral plate linguiform, and its anal plate oval. The movable chela is one-third the length of second cheliceral segment. The coxal spur formula is 0-2-2-1. Tarsus II is without apical claw-like spurs.

DESCRIPTION, HOLOTYPE FEMALE: *Idiosoma.*—537 μ long by 310 μ wide.

Venter (fig. 6A).—With 18–21 pairs of short, piliform opisthosomal setae. Sternal plate rectangular, anterior margin and sides nearly straight, posterior margin concave, anterior angles acute, posterior angles rounded; nearly three times wider than long; with three pairs of setae, first pair on anterior margin of plate; with two pairs of slit-like sternal pores; anterolaterally with reticulations. Presternal area sclerotized and reticulated. Tritosternum similar to that of *H. heteromydis*. A pair of metasternal setae and a circular pore present on soft integument adjacent to coxa III. Epigynial plate linguiform, not greatly constricted in middle; rounded posteriorly; surface punc-

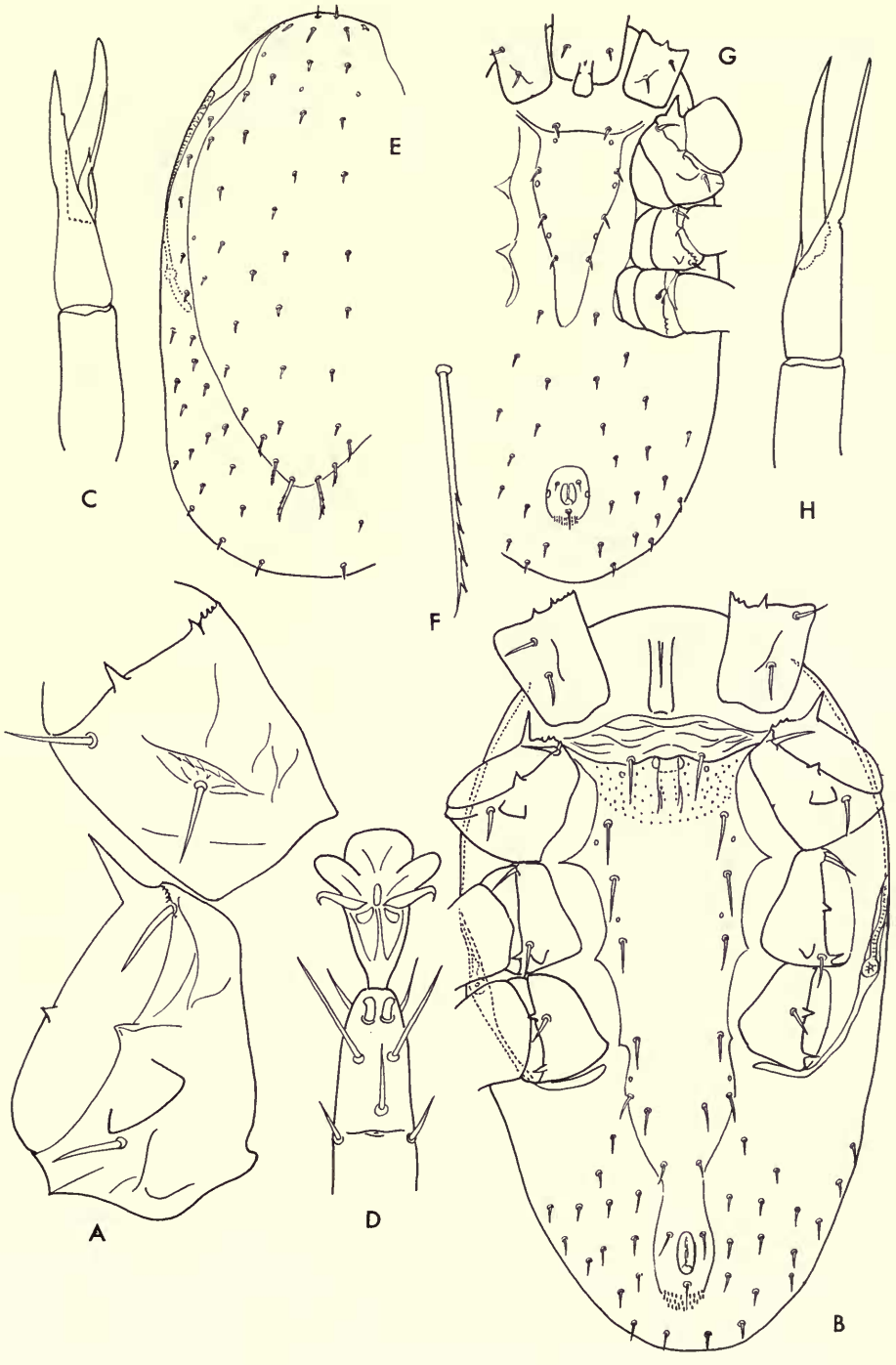

FIG. 5. *Hirstionyssus heteromydis*, new species, female (A), male (B–D), deutonymph (E–H). A, coxae I and II. B, venter. C, chelicera. D, tarsus II, ventral view. E, dorsum. F, terminal seta of dorsal shield. G, venter. H, chelicera.

tate; membranous anterior portion slightly overlapping sternal plate. A circular pore on soft integument either side of plate. Anal plate broadly oval, about three-fourths as wide as long; paired marginal pores appearing as minute punctations; anus in anterior of plate; adanal setae arising at a level with middle of anus. Coxa I with two piliform setae; coxa II with two piliform setae, a sharp anterior marginal spur, a broad dolabrate ventral spur and a sharply angulate posterior margin; coxae III with two piliform setae, a broad sharp ventral spur, and a slender, sharp, posterior marginal spur; coxa IV with a single piliform seta and a small, ventral, posterior marginal spur. Stigma ventral, appearing between femora III and IV; peritremalia narrow and curving posterior to coxa IV. Peritreme bending dorsally in area of coxa II and terminating at a point level with middle of coxa I. Peritremal plate narrow, widening at level of seta L2, continuing forward to anterior margin of coxa I.

Dorsum (fig. 6B).—Dorsal plate with straight sides, tapering posteriorly to a point, with at least 25 pairs of piliform setae, those anterior longest, those posterior slightly shorter than the 16–20 pairs of setae on adjacent soft integument.

Gnathosoma (fig. 6C–E).—Similar to that of *H. heteromydis* except that the movable chela forms no more than one-third of the total length of the chelicera. Deutosternal teeth not seen.

Legs.—Not significantly different from those of *H. heteromydis* except femora I and II without robust setae and tarsus II without whiplike setae (fig. 6F).

Measurements of sample.—Four females were measured. The numbers are averages. Idiosoma, length (exclusive of gnathosoma) 590 μ; width 300 μ. Dorsal shield, length 540 μ; width 260 μ. Sternal plate, length (at midline) 40 μ; width (at bases of second sternal setae) 115 μ. Epigynial plate, length 200 μ; width 80 μ. Anal plate, length (anterior border to base of postanal seta) 65 μ; width 50 μ. Legs: I, 310 μ; II, 240 μ; III, 225 μ; IV, 290 μ.

TYPE MATERIAL: Holotype female (U.S.N.M. no. 2818) from *Heteromys desmarestianus*, Piña (Canal Zone), 20 December 1960, collected by C. E. Yunker, in the United States National Museum. Three paratype females, same data but 13 December 1960, distributed among the collections of United States National Museum; Rocky Mountain Laboratory, Hamilton, Montana; and Texas Technological College, Lubbock.

REMARKS: *H. panamensis* is similar to *H. heteromydis* in the tectum, tritosternum, hypostomal processes, and ventral spur on coxa II. It differs in many ways from the latter. In *panamensis* the sternal plate is much wider and shorter, has rounded posterolateral angles, and possesses slit-like pores. In addition, its epigynial plate is broad in relation to length, and is rounded posteriorly. Its adanal setae originate at a point level with the middle of the anus. The movable chela forms less than one-third the length of the second cheliceral segment. The peritremalia is relatively wide posterior to the stigma. Tarsus II has only short setae.

None of the material before us offered a distinct view of the complete peritremalia, the deutosternum or the dorsal plate. It is probable that a pair of anterior pores are present on the dorsal plate, as well as more small pores and setae than we show. Some paratypes showed small barbs on the posterior dorsal setae.

Hirstionyssus minutus, new species. Figure 7.

DIAGNOSIS: This is a small species. The female is 400 μ long and the male 280 μ. The female sternal plate is rectangular, about twice wider than long. Its epigynial plate is linguiform and perceptibly broader in the post-

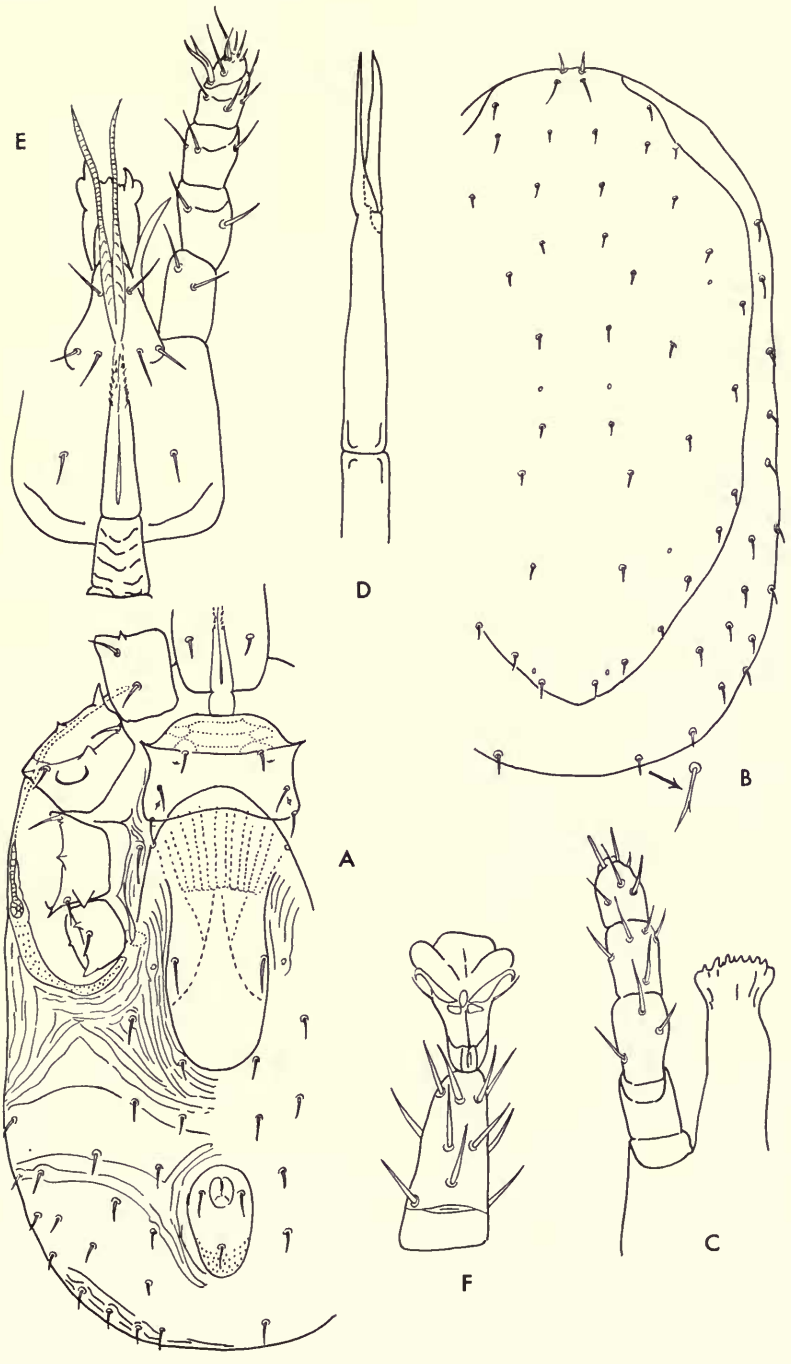

FIG. 6. *Hirstionyssus panamensis*, new species, female. A, venter. B, dorsum. C, gnathosoma, dorsal view. D, chelicera. E, gnathosoma, ventral view, and tritosternum. F, tarsus II, ventral view.

coxal area than in the intercoxal area. The movable chela is more than one-half the length of the second cheliceral segment. The coxal spur formula is 0-2-1-1. Tarsus II is without apical claw-like setae.

DESCRIPTION, HOLOTYPE FEMALE: *Idiosoma.*—425 μ long by 242 μ wide.

Venter (fig. 7A).—With 12-17 pairs of short, piliform opisthosomal setae, that become progressively shorter posteriorly. Sternal shield rectangular, anterior margin straight, lateral and posterior margins concave; with three pairs of setae and two pairs of pores; first sternal setae on anterior margin of plate; surface of plate with indistinct longitudinal wrinkles, anterolateral corners and presternal area reticulate. Tritosternum as in *H. heteromydis.* Metasternal seta and pore present but metasternal plate absent. A narrow endopodal apodeme between coxae III and IV. Epigynial plate linguiform, relatively broad in postcoxal area; bluntly rounded caudally; anteriorly overlapping part of sternal plate; with a pair of setae; surface densely covered with minute punctations. Anal plate a rounded oval, nearly as wide as long; with a pair of minute marginal pores; paired adanal setae at anterior margin of anus. Coxa I with two piliform setae; coxa II with two piliform setae, a sharp anterior marginal spur, a broad, dolabrate, ventral spur and a sharply angulate posterior margin; coxa III with two robust setae and a sharp ventral spur, coxa IV with a single piliform seta and a small, sharp posterior marginal spur. Stigma ventral, appearing between femora III and IV; peritremalia narrow and curving posterior to coxa IV; peritreme bending dorsally in region of coxa II, terminating at a point level with middle of coxa I; peritremal plate narrow.

Dorsum (fig. 7B).—Dorsal plate oval, broadly rounded caudally, covering most of dorsum; with 27–30 pairs of small setae and many small circular pores; anteriormost pair and posteriormost pair of setae 6 or 7 μ long, remainder extremely minute (less than 3 μ). About eight pairs of minute setae on unsclerotized dorsum.

Gnathosoma (figs. 7C–F).—Similar to that of *H. heteromydis* but movable chela slightly more than one-half length of second cheliceral segment, and a mediodorsal, apical, tarsal seta is markedly thick and blunt.

Legs.—Similar to those of *H. heteromydis*: ventral setae generally longer and more robust than dorsal setae, except on femora I and II where reverse is true; tarsus II with some moderately long ventral setae.

Measurements of sample.—Four females were measured. The numbers are averages. Length (exclusive of gnathosoma) 400 μ; width 230 μ. Dorsal shield, length, 382 μ; width 205 μ. Sternal plate, length (at mid-line) 45 μ; width (at basees of second sternal setae) 95 μ. Epigynial plate, length 177 μ; width (at widest point) 75 μ. Anal plate, length (to base of postanal seta) 39 μ; width 46 μ. Legs: I, 260 μ; II, 195 μ; III, 170 μ; IV, 225 μ.

ALLOTYPE MALE (figs. 7G–J): Length, 296 μ; width, 180 μ. Legs: I, 236 μ; II, 180 μ; III, 130 μ; IV, 210 μ; coxae as in female; tarsus II with two blunt claw-like setae ventrally. Holoventral plate expanded posterior to coxae; fused with anal plate; with nine pairs of setae plus the single postanal seta; with five pairs of pores; the first sternal pores slit-like, the rest circular. Dorsal plate similar to that of female.

TYPE MATERIAL: Holotype female (U.S.N.M. no. 2819), paratype female and allotype male from *Heteromys desmarestianus,* Piña (Canal Zone), 20 December 1960, collected by C. E. Yunker, in the United States National Museum. A paratype female, same data, in collection of Rocky Mountain Laboratory, Hamilton, Montana, and another, same data, in collection of Institute of Acarology, Agriculture Experiment Station, Wooster, Ohio. A paratype male and female, same data, but 7 December 1960, in collection of Texas Technological College, Lubbock.

REMARKS: *H. minutus* resembles *H. heteromydis* in the tectum, tritosternum, hypostomal processes, chelicerae and leg setation. It differs from the latter in size, by having only one spur on coxa III, by having less than

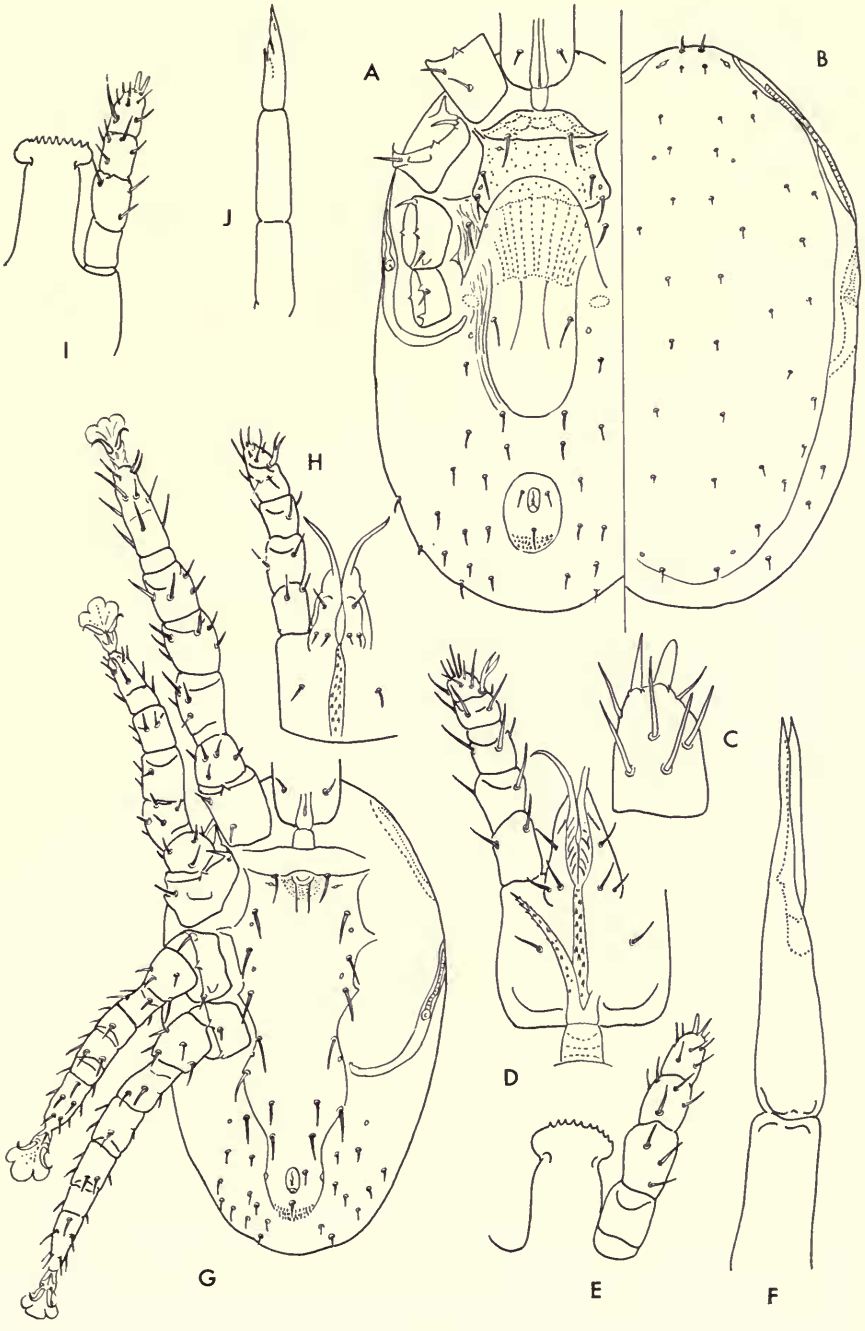

FIG. 7. *Hirstionyssus minutus*, new species, female (A–F), male (G–J). A, venter. B, dorsum. C, palpal tarsus, dorsal view. D, gnathosoma, ventral view, and tritosternum. E, tectum and palp, dorsal view. F, chelicera. G, venter (one adanal seta omitted). H, gnathosoma, ventral view. I, tectum and palp, dorsal view. J, chelicera.

17 pairs of opisthosomal setae, and by having many minute dorsal shield setae. In addition, shapes of the body plates are typical. The dorsal shield, epigynial plate and posterolateral angles of *H. minutus* are broadly rounded posteriorly; the epigynial plate is relatively expanded posterior to coxae IV and the anal plate is almost circular.

It differs from *H. panamensis* in chela/chelicera length-ratio, by adanal setae that arise at the anterior margin of the anus; by a longer sternal plate, by having only one spur on coxa III, by the minute dorsal setae, and by the robust, blunt mediodorsal seta of the palpal tarsus.

The dorsal setae are so small that it is difficult to distinguish between a setal base and a pore.

Hirstionyssus microchelae, new species. Figure 8A–D.

DIAGNOSIS: The female is 620 μ long and 440 μ wide at its greatest width. Its sternal plate is rectangular and three times wider than long. Its epigynial plate is linguiform and truncate, and its anal plate circular. Its chelicerae are slender and the movable chelae are small, each less than one-seventh the length of the second cheliceral segment. The coxal spur formula is 0-2(3?)-2-1. Tarsus II is without apical claw-like setae. The posterior dorsal setae are serrate.

DESCRIPTION, HOLOTYPE FEMALE: *Idiosoma.*—590 μ long by 384 μ wide.

Venter (fig. 8A)—With about 22–25 pairs of opisthosomal setae. Sternal plate rectangular, with straight anterior and lateral margins and a slightly convex posterior margin; nearly three times wider than long; with three pairs of setae and two pairs of slit-like pores; first sternal setae on anterior margin of plate; anterolateral corners and presternal area reticulate. Tritosternum as in *H. heteromydis.* Metasternal seta and pore present, but metasternal plate absent. A narrow endopodal apodeme between coxae III and IV. Epigynial plate linguiform, not greatly widened in postcoxal area; bluntly rounded caudally; anteriorly overlapping part of sternal plate; with a pair of setae; surface densely punctate. Anal plate circular; with a pair of minute marginal pores; paired adanal setae at a level with posterior of anus. Coxa I with two piliform setae, its peripheral margins fimbriate; coxa II with two piliform setae, a large, sharp anterior marginal spur, a small blunt ventral spur, and a sharp, angulate posterior dorsal margin that may be spur-like; coxa III with two piliform setae, a blunt ventral spur, and a sharp posterior dorsal spur; coxa IV with one piliform seta and a small, sharp posterior marginal spur. Stigma ventral, appearing between femora III and IV; peritremalia narrow and curving posterior to coxa IV; peritreme bending dorsally in region of coxa II, terminating at a point level with middle of coxa I; peritremal plate visible on either side of peritreme, widening abruptly in anterior third, terminating adjacent to paired, slit-like, dorsal shield pores.

Dorsum (fig. 8B).—Dorsal shield elliptical, sides slightly convex, tapering caudally to a blunt point; with 26 pairs of short setae, those posterior serrate; with 19 or 20 pairs of small circular pores and a pair of large, slit-like, anterior pores. With 40–50 pairs of setae on adjacent soft integument.

Gnathosoma (fig. 8C).—Similar to that of *H. panamensis,* except that the chelicerae are relatively narrow and elongate. The movable chela is less than one-sixth the length of the second cheliceral segment (fig. 8D).

Legs.—Not significantly different from those of *H. panamensis.*

Measurements of sample.—Three females were measured. The numbers are averages. Idiosoma, length 572 μ; width 378 μ. Dorsal shield, length 500 μ; width 290 μ. Sternal plate, length (at mid-line) 41 μ; width (at bases of second sternal setae) 122 μ. Epigynial

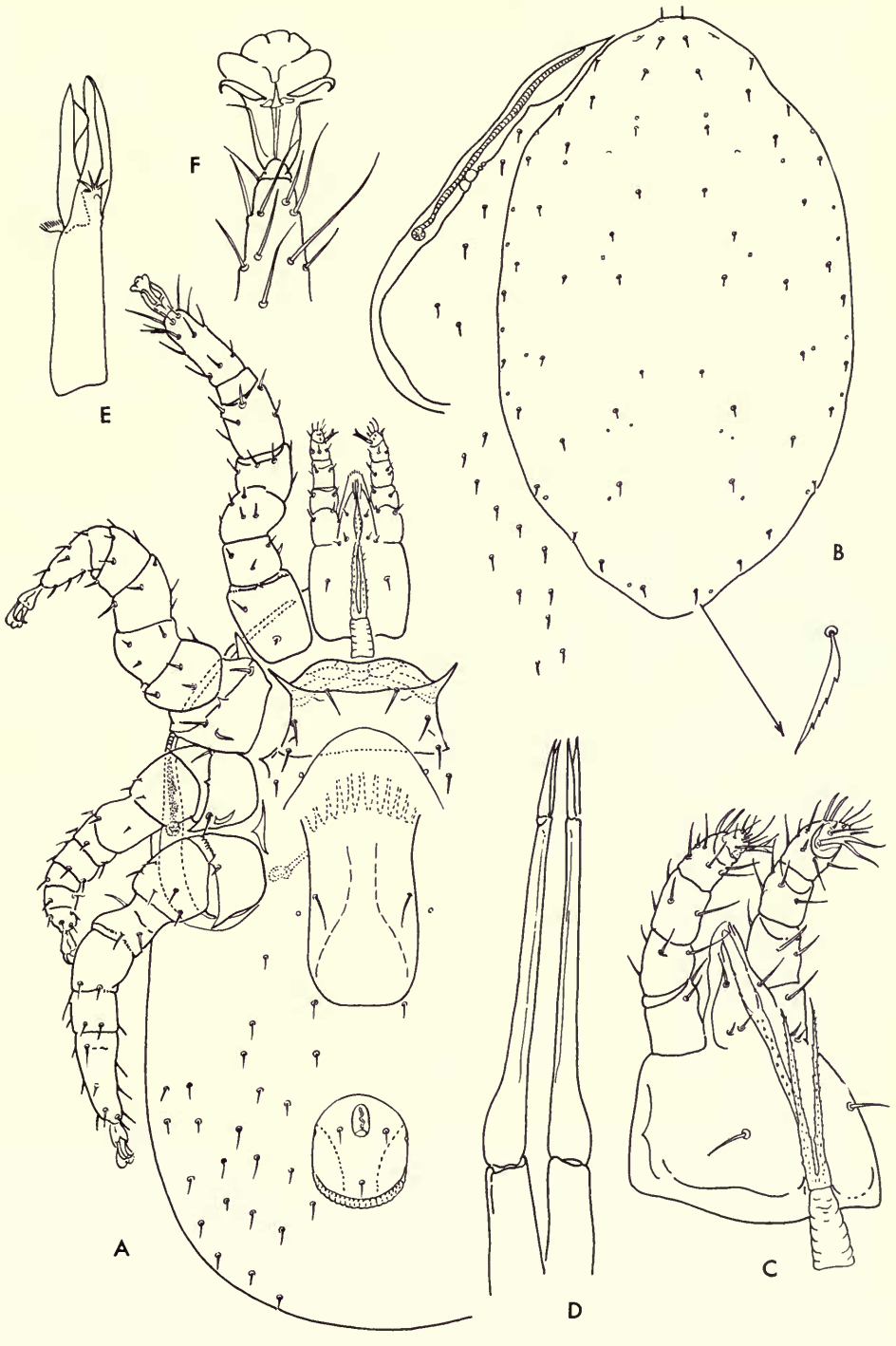

FIG. 8. *Hirstionyssus microchelae*, new species, female. A, venter. B, dorsum and peritremalia. C, gnathosoma and tritosternum, oblique view. D, chelicerae. *Hirstionyssus keenani*, new species, female. E, chelae. F, tarsus II, ventral view.

plate, length 220 μ; width 100 μ. Anal plate, length (to base of postanal seta) 70 μ; width 80 μ.

TYPE MATERIAL: Holotype female (U.S.N.M. no. 2820) and 4 paratype females from *Heteromys desmarestianus,* Piña (Canal Zone), 13 December 1960, collected by C. E. Yunker, in the United States National Museum. Six paratype females, same data, distributed among the collections of Rocky Mountain Laboratory, Hamilton, Montana; Texas Technological College, Lubbock; Institute of Acarology, Agriculture Experiment Station, Wooster, Ohio; and British Museum (Natural History), London.

ADDITIONAL MATERIAL EXAMINED: Two females from type host and locality, but 29 December 1961; 1 female from *Liomys adspersus,* Guánico, Las Palmitas (Los Santos), 10 February 1962, collected by C. O. Handley and F. Greenwell; 2 females from type host, Almirante (Bocas del Toro), 7 September 1960, collected by P. Galindo; 7 females from type host, Río Changena (Bocas del Toro), at lower camp, 22 miles WSW of Almirante, elevation about 2800 feet, 17 September 1961, collected by C. E. Yunker.

REMARKS: *H. microchelae* is easily distinguished from other Panamanian species by the chela/chelicera length-ratio and the circular anal plate. In addition, crushed specimens reveal a pair of circular pores on the medial aspect of the peritremal plate anterior to the stigma. These are closely associated with a pair of square, cell-like depressions or muscle-scars (fig. 8B). Variation was apparent in the shape of the posterior margin of coxa II. In some specimens this margin was angulate and distinctly spur-like; in others, including the holotype, no such modification could be seen. It is possible that this difference is an artifact of mounting.

The type specimens were taken from a host that was simultaneously infested with *heteromydis, panamensis* and *minutus.* All females of *microchelae* appeared to be engorged on blood, whereas none of the other species did.

Hirstionyssus keenani, new species. Figures 8E–F, 9.

DIAGNOSIS: This is a typical *Hirstionyssus* species, characterized by a female sternal plate that is deeply concave at its posterior margin and acute, elongate coxal spurs. The female is 500μ long $\pm$ 30 μ, and approximately one-half as wide. The coxal spur formula is 0-2-2-1, tarsus II lacks claw-like setae, and the dorsal shield setae are noticeably shorter than the ventral setae.

DESCRIPTION, HOLOTYPE FEMALE: *Idiosoma.*—513 μ long by 325 μ wide.

Venter (fig. 9A).—With 20–24 pairs of setae. Sternal plate deeply emarginate posteriorly, seven times wider than long; with three pairs of approximately equal setae, and two pairs of circular pores; first sternal setae on anterior margin of plate; anterolateral corners and presternal areas reticulate. Tritosternal base punctate; laciniae weakly ciliate. Metasternal setae and pore present, but metasternal plate absent. A narrow endopodal apodeme present between coxae III and IV. Epigynial plate linguiform, not greatly widened posterior to coxae, rounded caudally; surface densely covered with minute punctae; with a single pair of setae. A circular pore on each side near genital setae. Anal plate oval; surface punctate; anus in anterior third of plate; paired adanal setae arising at a level with middle of anus. Coxa I with two piliform setae, the distal one longer and heavier than the proximal one; coxa II with two piliform setae, a sharp anterior marginal spur and an acute, elongate ventral spur; coxa III with two pili-

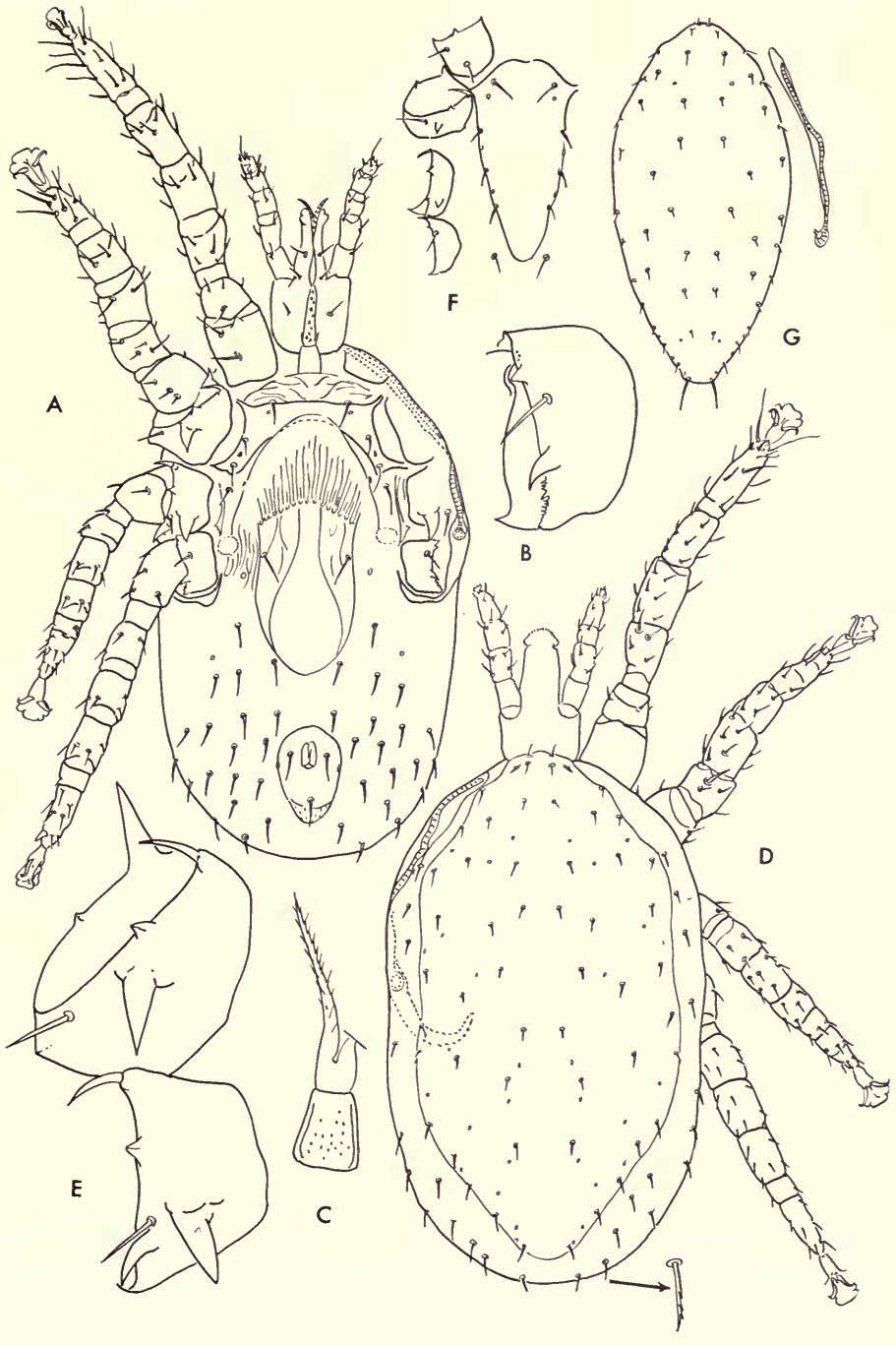

FIG. 9. *Hirstionyssus keenani*, new species, female (A–E), deutonymph (?) (F, G). A, venter. B, coxa IV. C, tritosternum. D, dorsum. E, coxae II and III. F, coxae and holoventral plate. G, dorsal shield and peritremalia.

form setae and two acute, elongate spurs; coxa IV with a single piliform seta and a small, sharp marginal spur. Stigma ventral almost marginal, appearing between femora III and IV; peritreme bending dorsally in region of coxa II, continuing anteriorly as far as anterior margin of coxa I; peritremal plate narrow.

Dorsum (fig. 9D).—Dorsal shield elliptical with straight, parallel sides; tapering caudally in a blunt point; with 26 pairs of piliform setae shorter than those on adjacent soft integument; with 17 pairs of pores, the anteriormost pair slit-like, the remainder circular. With 20–22 pairs of setae on adjacent soft integument, slightly shorter than ventral setae.

Gnathosoma.—With 12–14 deutosternal teeth arranged in an irregular file. Hypostomal processes drawn out into two long lacinae. Tectum a transparent, long membrane with a truncate, fimbriate anterior margin. Movable chela elongate, about one-third the length of the second cheliceral segment; with a transparent, triangular medial tooth, and a ciliated basal lobe. Fixed chela with a hyaline, stellate, seta-like structure arising opposite base of movable chela, adjacent to a small circular pore (fig. 8E).

Legs.—Setation typical of *Hirstionyssus* spp. Femur I with two and femur II with one robust dorsal setae. Tarsus II with some long, whip-like ventral setae (fig. 8F). Tarsus IV with a terminal spur-like seta.

Measurements of sample.—Five females were measured. The numbers are averages. Idiosoma, length (exclusive of gnathosoma) 500 μ; greatest width 320 μ. Dorsal shield, length 450 μ; greatest width 252 μ. Sternal plate, length (at mid-line) 15 μ; width (at bases of second sternal setae) 126 μ. Epigynial plate, length 257 μ; width (just posterior to genital setae) 93 μ. Anal plate, length (anterior border to base of postanal setae) 63 μ; width 63 μ. Legs: I, 333 μ; II, 260 μ; III, 245 μ; IV, 315 μ.

TYPE MATERIAL: Holotype female (U.S.N.M. no. 2821) and two paratype females from *Sciurus variegatoides,* Gamboa (Canal Zone), 4 December 1960, collected by C. E. Yunker, in the United States National Museum. Three paratype females, same data, distributed among the collections of Rocky Mountain Laboratory, Hamilton, Montana, and Texas Technological College, Lubbock.

ADDITIONAL MATERIAL EXAMINED: Two females and one deutonymph from *Sciurus granatensis chiriquensis,* Martinz's dairy, Cerro Punta (Chiriquí), elevation about 6800 feet, 2 May 1961, collected by C. E. Yunker. One female, same type host and locality, but 12 March 1962, and one deutonymph, data same as holotype (figs. 9F, G). Coxae III and IV of the nymph lack the marginal spur seen in the female. The dorsal plate setae are similar to those of the female, except that the terminal pair is long (a characteristic of immature specimens of *Hirstionyssus*).

REMARKS: The combination of arcuate sternal plate, coxal spur formula 0-2-2-1, and lack of claw-like setae at the ventral apex of tarsus II is shared by only one other species, *H. neotomae* Eads and Hightower, 1951. The latter, however, has a sternal plate less deeply concave (length-width ratio is 1:4.3, as compared with 1:7.4 for *H. keenani*); its coxal spurs are much smaller, and the anterior dorsal setae are longer. In *H. neotomae,* the first three rows of dorsal plate setae overlap, whereas in *H. keenani* none of the setae on the dorsal plate are long enough to reach the bases of those in the succeeding row. *H. keenani* also resembles *H. isabellinus* (Oudemans, 1913), but in this latter species the sternal plate is even less arcuate than in *H. neotomae* and coxa IV lacks a spur.

H. keenani is named for Charles M. Keenan, Chief, Vector Control Sec-

tion, Environmental Health Branch, United States Army Caribbean, and Canal Zone naturalist.

Hirstionyssus galindoi, new species. Figure 10.

DIAGNOSIS: The female sternal plate is about four times wider than long. The chelae are one-half the length of the second cheliceral segment. The

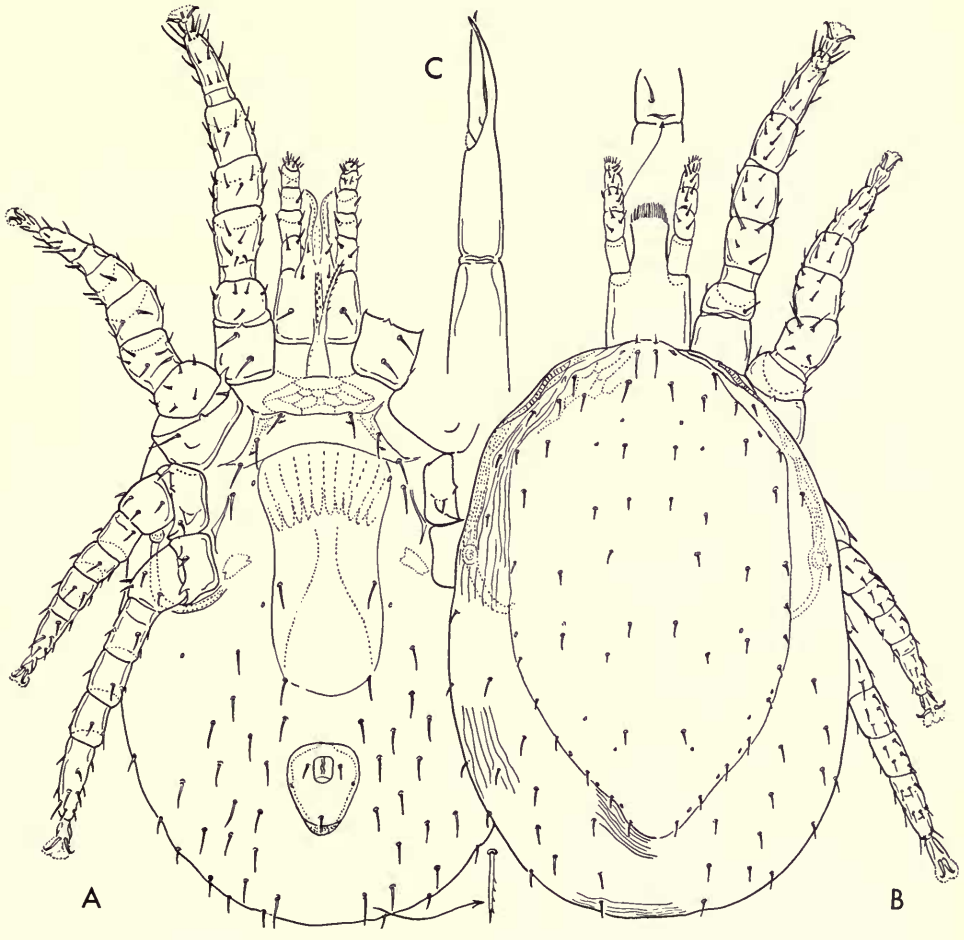

FIG. 10. *Hirstionyssus galindoi,* new species, female. A, venter. B, dorsum. C, chelicera.

coxal spur formula is 0-1-2-1 or 0-2-2-1, coxa II sometimes having a small, rounded ventral knob that might be taken for a spur. Tarsus II is without claw-like setae.

DESCRIPTION, HOLOTYPE FEMALE: *Idiosoma.*—462 μ long by 326 μ wide.

Venter (fig. 10A).—Sternal plate short, about four times wider than long, deeply and broadly concave posteriorly, anterior margin nearly straight; lightly reticulated at sides; the three pairs of subequal sternal setae shorter than plate. Presternal area

lightly reticulated. Tritosternum without basal hyaline margins; laciniae ciliate and extending nearly to the apical hypostomal setae. Metasternal setae subequal to sternals. Without metasternal plates. Epigynial plate linguiform; genital and all ventral setae subequal, longer than dorsals; one pair of ventrals on the posterior margin of the plate or apparently so. Posterior ventral setae as well as smaller marginal and dorsal setae weakly serrate on one side (fig. 10A). Anal plate broadly ovate; the three anal setae slender, subequal, and shorter than anal slit. Adanal setae inserted opposite the middle of the anal slit. With 15 or 16 pairs of ventral non-plate setae. Metapodal plates absent. Peritreme ventrolateral, becoming dorsal over coxa II, and extending to level of middle of coxa I; surrounded by a narrow peritremal plate, which encircles coxa IV posteriorly.

Dorsum (fig. 10B).—Dorsal shield with sides subparallel, tapering posteriorly to a blunt wedge; with 26 pairs of short setae which are a bit longer anteriorly and peripherally; lightly reticulated in scapular area. With 10–12 pairs of dorsal, non-plate setae.

Gnathosoma.—Setation weak; deutosternal teeth in a double file, with about 14–17 denticles. Malae internae long, slender; tectum truncate, with a deeply ciliated margin. Chelicerae relatively short and heavy, the chelae (fig. 10C) forming one-half the length of the second cheliceral segment. Palpal genu with a transverse dorsal pore near base (fig. 10B).

Legs.—Setae of legs slender and piliform; femora I and II each with two slightly enlarged dorsal setae; femora III and IV each with one slightly enlarged dorsal seta. Coxa I with two subequal piliform setae; coxa II with an anteromarginal spur and a small, rounded ventral boss; coxa III with a ventral and a posteromarginal spur, both small and acute; coxa IV with one small, sharp marginal spur. Tarsus II without claw-like subapical setae.

DEUTONYMPH: Length of idiosoma, 305 μ. Sternal shield extending to level of posterior margin of coxa IV, as is usual for deutonymphs of this family. The first four pairs of setae are marginal, the fifth pair is off the margin near the posterior end. Coxa II with a slight ventral elevation; coxa III with an acute ventral spur; coxa IV without a spur but with small denticles on the posteroapical margin. Dorsal plate entire, bearing two long, weakly barbed setae at posterior tip. Peritreme extending to level of posterior margin of coxa I; poststigmal plate lacking.

MALE: Unknown.

TYPE MATERIAL: Holotype female (U.S.N.M. no. 66415) and one paratype female from *Scotinomys xerampelinus*, Cerro Punta (Chiriquí), elevation about 7000 feet, 14 March 1962, in the United States National Museum; three paratype females and 3 paratype nymphs from *Peromyscus nudipes*, same data, but 9 to 14 March 1962; all collected by C. M. Keenan. Paratypes distributed among collections of United States National Museum; Texas Technological College, Lubbock; and Rocky Mountain Laboratory, Hamilton, Montana.

REMARKS: This species is closest to *H. breviseta* Strandtmann and Morlan, 1953. The latter, however, is without ventral spurs or knobs on coxa II and its first sternal setae are extremely close set; in addition, the spurs of coxa III are not as pronounced as in the present species. *H. galindoi* also resembles *H. transiliensis* Bregetova, 1956, but in the latter species there are no ventral non-plate setae so close to the epigynial plate as to appear to be touching it. The ventral idiosomal setae of *H. galindoi* are long enough to reach the bases of succeeding setae, while those of *H. transiliensis* are quite short.

H. galindoi is named for Sr. Pedro Galindo V., Gorgas Memorial Laboratory, Panama, who kindly provided certain specimens examined in this study.

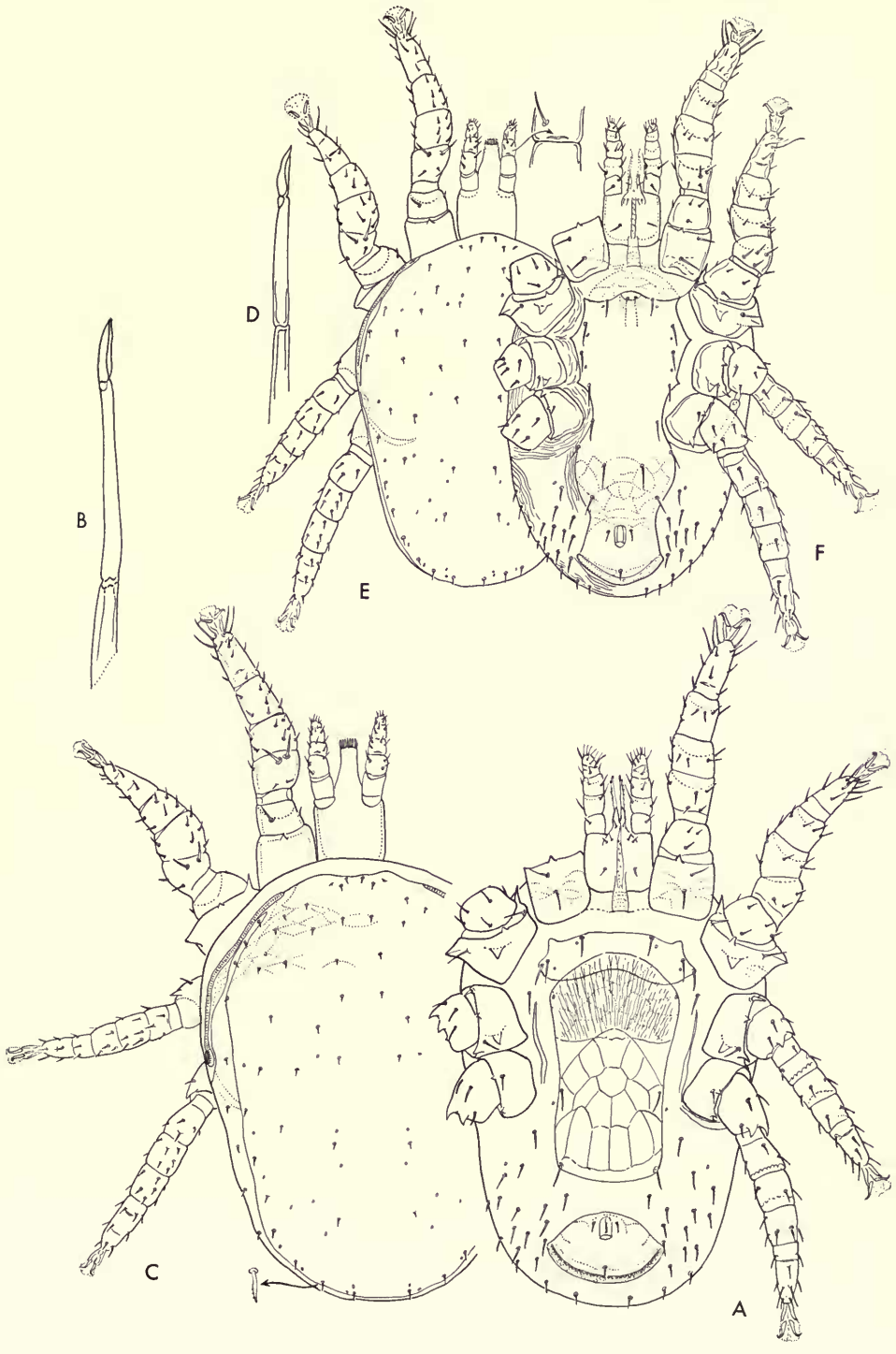

FIG. 11. *Hirstionyssus lunatus*, new species, female (A–C), male (D–F). A, venter. B, chelicera. C, dorsum. D, chelicera. E, dorsum. F, venter.

Hirstionyssus lunatus, new species. Figure 11.

DIAGNOSIS: This is a small species; the female is 350 μ long and has short, delicate setae. It is instantly recognizable by the unusual shape of the anal plate and especially the wide cribrum, which subtends the plate as a semicircular crescent. The epigynial plate is uniquely scaly in appearance. The coxal spur formula is 0-3-3-1, and trochanters III and IV each bear two heavy apical spurs. Tarsus II is without claw-like apical setae.

DESCRIPTION, HOLOTYPE FEMALE (figs. 11A–C). Idiosoma 340 μ long by 238 μ wide.

Venter (fig. 11A). Sternal plate slightly arched, smooth or only faintly lined; the corners rounded, not noticeably projecting between the coxae. First sternal setae mesad of first sternal pores; second sternal pores well mesad of sternal setae 2 and 3. Sternal pores small and circular. Sternal setae 2 and 3 close set. Sternal setae 1 slightly shorter than 2 and 3. Presternal area not heavily sclerotized, very faintly lined. Tritosternum weak, transparent; basal portion transversely wrinkled; laciniae finely ciliated. Epigynial plate broad and anteriorly overlapping part of sternal plate; posterior margin broad, slightly convex, with one pair of epigynial setae; in addition a single pair of setae arise from the posterolateral margins of the plate; entire plate reticulate and scaly in appearance. Anal plate unusual for genus. Posterior margin broadly flared; cribrum subtending posterior margin as a crescentic band. Anal opening near anterior margin of plate. Adanal setae arising at anterior level of anal slit, and subequal to it in length. Postanal seta well removed from anal slit; near cribrum; subequal to adanals. From seven to 11 pairs of ventral non-plate setae which become shorter and heavier laterally.

Dorsum (fig. 11C).—Dorsal shield covering most of dorsum, straight sided, and broadly rounded anteriorly and posteriorly. With 26 pairs of minute setae that are a bit larger posteriorly. At least posteriormost of these slightly serrate on one side (fig. 11C). Stigma dorsolateral; peritreme mostly dorsal; enclosed in a narrow plate that attaches to dorsal shield over coxa II. Peritreme extending nearly to level of middle of coxa I.

Legs.—Majority of setae short and slender. Both setae of coxa I piliform, the proximal somewhat longer. Coxa II with an anteromarginal spur, a ventral triangular spur, and the posterior margin produced into a large, acute projection, here counted as a spur; with two piliform setae. Coxa III with a ventral spur, a posteromarginal spur and two setae; the anteromarginal seta slender and spiniform, the posteromarginal setae piliform. Coxa IV with a marginal tooth and a single piliform seta. Anterior apical margin of trochanters III and IV each with three sharp spurs or teeth. Femora I and II with each a pair of enlarged dorsal setae. Tarsus II modified into a slight hook at apex but without claw-like setae. One pair of slender, flagelliform medioventral setae on tarsus II. Inner margin of femora and genua III and IV slightly crenulated.

Gnathosoma.—Setae small and slender. Hypostomal and gnathosomal setae small. Malae internae long and slender. Tectum extending as far as level of middle of palpal tibiae; with a ciliate margin. Chelicerae long and slender; chelae about one-fourth as long as second cheliceral segment (fig. 11B).

MALE (figs. 11D–F): *Idiosoma.*—275 μ long by 188 μ wide.

Venter (fig. 11F).—Holoventral plate slightly expanded behind coxa IV, with eight pairs of setae, none of which quite reaches the base of the succeeding seta, plus three smaller anal setae; the latter slender and shorter than anal slit. Anal plate wide, with crescentic cribrum as in female.

Dorsum (fig. 11E).—Dorsal shield nearly covering dorsum; with 28 pairs of very small setae that are slightly longer posteriorly. Peritreme extending nearly to level of middle of coxa I. Stigma ventrolateral.

Legs.—Tarsus II with two subapical clawlike setae, basad of these are two long flagelliform setae. Trochanters II and III lack the marginal spurs of the female. Coxa

IV with one or two anteromarginal teeth as well as the posteromarginal spur. The coxal spurs are relatively smaller than those of the female.

Gnathosoma.—Not significantly different from that of the female. Chelicerae slender, chelae unmodified.

TYPE MATERIAL: Holotype female (U.S.N.M. no. 66611), three paratype females and one allotype male from *Heteromys desmarestianus,* Río Changena (Bocas del Toro), lower camp, approximately 22 miles WSW of Almirante, elevation about 2800 feet, 27 September 1961, collected by C. E. Yunker. Two paratype females from type host, Piña (Canal Zone), 13 December, 1960, collected by C. M. Keenan. Holotype female, allotype male and one paratype female deposited in the United States National Museum. One paratype female in the collection of Rocky Mountain Laboratory, Hamilton, Montana, and one paratype female in the collection of Texas Technological College, Lubbock.

KEY TO THE PANAMANIAN SPECIES OF *HIRSTIONYSSUS*

FEMALES

1. Epigynial plate with scalelike pattern and two pairs of setae; anal plate much wider than long, laterally angulate; trochanters III and IV with large distal marginal spurs ..... *H. lunatus* n. sp.
   Without this combination of characters 2
2. Sternal plate approximately rectangular; ventral spur of coxa II broad and dolabrate, reduced, or absent, on heteromyid or cricetid rodents 3
   Sternal plate arcuate, posterior border deeply emarginate; ventral spur of coxa II acute and elongate; on *Sciurus* ..... *H. keenani* n. sp.
3. Chelicerae slender, long; movable chela at most one-sixth the length of second cheliceral segment; anal plate circular ..... *H. microchelae* n. sp.
   Chelicerae normal; movable chela at least one-third as long as second cheliceral segment 4
4. Dorsal shield setae normal or reduced but not minute; coxae III with two spurs 5
   Dorsal shield setae extremely minute; coxa III with one spur; a small species about 400 μ long; with less than 18 pairs of ventral opisthosomal setae ..... *H. minutus* n. sp.
5. Sternal plate at least three times wider than long; sternal pores slitlike; coxa IV with one spur 6
   Sternal plate not quite twice wider than long; sternal pores circular; coxa IV without spurs ..... *H. heteromydis* n. sp.
6. Sternal plate three times wider than long; movable chela one-third length of second cheliceral segment ..... *H. panamensis* n. sp.
   Sternal plate four times wider than long; movable chela one-half length of second cheliceral segment ..... *H. galindoi* n. sp.

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